

# METHOD OF PREVENTING DISCOLORATION OF PLATINUM CONTAINING SILICONE GELS

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates to a method of making a silicone gel which discolors less on aging.

### 2. Description of the Prior Art

Silicone gels are known materials and many are known to be platinum catalyzed. One problem which arises in certain applications is discoloration on aging. The properties of the silicone gel are not altered by the discoloration except where aesthetic value is important or optical properties are required.

The use of vinyl containing polysiloxanes having silicon-bonded hydroxyl and epoxy silane for promoting adhesion of platinum cured compositions is known in the art from U.S. patent application Ser. No. 799,877, filed May 23, 1977 by Jay R. Schulz and entitled "Self-adhering Silicone Compositions and Preparation Thereof" now U.S. Pat. No. 4,087,585. The present invention is specific to silicone gels and to the method for making these gels. It has been found that some improvement is observed in using the combination as described by Schulz, but a significant improvement is obtained by mixing the vinyl containing polysiloxane having silicon-bonded hydroxyl and the epoxy silane separately to the vinyl-containing polyorganosiloxane before the remaining ingredients are added to make the silicone gel.

## SUMMARY OF THE INVENTION

It has now been discovered that the method of preparing platinum catalyzed silicone gels with certain ingredients results in gels which exhibit less coloration on aging. It was completely unexpected that a vinylated polysiloxane and an epoxy silane could be used in making a silicone gel. Because silicone gels are low in the number of crosslinks per unit of gel, the addition of molecular species which could provide large numbers of crosslinks would be expected to provide either rubber type products or hard brittle resinous type products instead of gel products. The applicant has unexpectedly found that the method of mixing the ingredients and the type of ingredients results in both the production of a silicone gel with conventional gel properties while providing the advantage of providing a silicone gel which colors less on aging.

Separately combining the vinyl-containing polysiloxane and the epoxy silane with the vinyl-containing polyorganosiloxane before the remainder of the required ingredients are mixed to provide the silicone gel composition provides a cured silicone gel which exhibits reduced discoloration on aging.

## DESCRIPTION OF THE INVENTION

This invention relates to a method for preventing discoloration of a silicone gel comprising mixing (A) vinyl-containing polyorganosiloxane having an average of about two silicon-bonded vinyl radicals per molecule, an average ratio of organo radicals per silicon atom within a range greater than 2 up to and including 2.03, and each organo radical of the polyorganosiloxane being a monovalent radical selected from the group consisting of hydrocarbon radicals and fluorinated alkyl radicals both having less than 7 carbon atoms per radical, (B) an organosilicon compound having an average

of at least 3 silicon-bonded hydrogen atoms per organosilicon compound molecule and valences of any silicon atom in the organosilicon compound not satisfied by a hydrogen atom is satisfied by a divalent oxygen atom or an organo radical wherein each organo radical is a monovalent radical selected from the group consisting of hydrocarbon radicals and fluorinated alkyl radicals both having less than 7 carbon atoms per radical, the organosilicon compound having no more than one silicon-bonded hydrogen atom on any one silicon atom, (C) polysiloxane having at least one silicon-bonded hydroxyl radical per molecule and at least two silicon-bonded vinyl radicals per molecule, the polysiloxane having siloxane units bonded through silicon-oxygen-silicon bonds and valences of each silicon atom in the polysiloxane are satisfied by at least one of monovalent alkyl radical having less than 7 carbon atoms per radical, divalent oxygen, phenyl radical, vinyl radical and hydroxyl radical the polysiloxane having an average of less than 15 silicon atoms per molecule, (D) a silane having at least one epoxy-containing organo group, at least one silicon-bonded alkoxy group having less than 5 carbon atoms per group, and any remaining valences of the silane not satisfied by an epoxy-containing organo group or an alkoxy group is satisfied by a monovalent hydrocarbon radical or a fluorinated alkyl radical both having less than 7 carbon atoms per radical, and (E) a platinum catalyst, (A) and (B) being present in amounts sufficient to provide a mol ratio of silicon-bonded hydrogen atoms in (B) to silicon-bonded vinyl radical in (A) of less than one, the combined weight of (C) and (D) is less than 1.5 weight percent of the total composition, (C) being present in an amount of from 75 to 350 parts by weight per one part by weight of platinum and (D) being present in an amount of from 50 to 300 parts by weight per one part by weight platinum, said mixing of ingredients is such that (C) and (D) are separately combined with a part of (A) before the remainder of the ingredients are combined, after the ingredients are combined, the resulting composition cures to a silicone gel which has a penetration of from 2 to 60 millimeters. The penetration values for this invention are measured by a precision Universal penetrometer Catalog No. 73,510 of the Precision Scientific Company. Instead of using the standard cones supplied with the penetrometer, a brass head 6.350 mm in diameter and 4.762 mm high with a flat bottom and rounded edges is used. The total weight of the shaft and head is 19.5 g. For sample preparation, 100 g. of gel composition is placed in  $2.3 \times 10^{-4}$  m<sup>3</sup> wide mouth jar and cured for 1 hour at 150° C.

The best method for preparing the silicone gels is to combine by mixing into (A), (C) and (D) separately. The order of mixing is not critical. For example, (C) may be added to (A) followed by the addition of (D), or (A) may be added to (C) followed by the addition of (D) or (D) may be added to (A) followed by the addition of (C). The additions are made with mixing and because (D) is sensitive to moisture, long exposure to moisture should be avoided and it is best to use essentially anhydrous conditions for the preparation as well as for storage. The platinum catalyst can be combined with (A) either before (C) and (D) are added or after (C) and (D) are added. Because of the smaller amounts of all of the other ingredients, it is advantageous to mix the other ingredients with (A) before combining all the ingredients to make the silicone gel. It is, therefore, preferable for convenience to divide (A) into equal weight amounts and use one half to combine with (C), (D) and